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EXAMINER

ASHTON, R

ART UNIT PAPER NUMBER

1752

DATE MAILED: 07/23/01

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.
09/541,597

Applicant(s)
Sato et al.

Examiner
Rosemary Ashton

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on May 30, 2001
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-3 is/are allowed.
- 6) ☒ Claim(s) 4-13 is/are rejected.
- 7) ☒ Claim(s) 14 is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☒ All b) ☐ Some* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- *See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892) 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 19) ☐ Notice of Informal Patent Application (PTO-152)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 20) ☐ Other:

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DETAILED ACTION

Response to Amendment

1. The Declaration under 37 CFR 1.132 filed May 30, 2001 is insufficient to overcome the rejection of claims 4-13 based upon Goodall, Allen and Aoai as set forth in the last Office action because: Applicant has not demonstrated any unexpected results with respect to the art applied in the rejection and it is not commensurate in scope with the claims of the invention. There is no discussion of the results in the Declaration, other than to say they are unexpectedly superior. The data presented is not unexpected or superior.

In section (1) the results for 11b and 12b are substantially the same. The comparative data can not be used because 4b contains an organic base.

As to section (2) example 13c reads on claim 14 which is an objected claim, indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Thus, section (2) does not read on claims 9-13 and the results are not compared with the solvent mixture of Allen.

Section (3) shows expected results. Examples 13b and 14b, both having a SAA/surfactant and an acid diffusion control agent (the basic compound), are substantially the same with low development defects. Comparing example 14b and example 7b simply shows the well known advantage of adding a surface active agent to a photoresist composition. The results in Table C, section (3) comparing example 13b with example 5b are expected results because the

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addition of a SAA and an acid diffusion control agent (the basic compound) provide the expected results of lower number of development defects.

The examiner suggests that in future Declarations the applicant includes the reagents used in the experiments in the Declaration or point to their location in the specification.

Response to Arguments

2. Applicant's arguments filed May 9, 2001 have been fully considered but they are not persuasive. Applicant's arguments are directed to the Declaration and the position that it shows unexpectedly superior results. The examiner does not find the Declaration persuasive for the reasons stated above.

Additionally, the examiner notes that claim 4 is directed to a resist composition comprising a photoacid generator, a polymer and a fluorine or silicon containing surface acting agent, which is also called a surfactant in the art. Claim 9 is directed to a resist composition comprising a photoacid generator, a polymer and a mixed solvent with dependent ^{claims 7 and 8} claim 12 reading on ^{an} a organic base.

In addition to the art applied in the above rejections the examiner notes applicant's invention is directed to the "customary additives" to a photoresist composition of a SAA/surfactant, solvent and organic base. Patents reciting photoresist compositions having photoacid generators frequently include applicant's claimed additives under the heading "customary additives" or "optional additives" in that they are known to improve the properties of the photoresist composition. For example in column 13, lines 29-47, Yamachika discloses:

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Various additives

The compositions A and B may, if necessary, contain various additives such as a surfactant, a sensitizer or the like.

The above surfactant has an action to improve the coatability of the compositions A and B, striation, developability of resist and the like. Such surfactants include, for example, polyoxyethylene lauryl ether, polyoxyethylene stearyl ether, polyoxyethylene oleyl ether, polyoxyethylene octylphenyl ether, polyoxyethylene nonylphenyl ether, polyoxyethylene glycol dilaurate and polyoxyethylene glycol distearate and also include KP341 (a trade name of Shin-Etsu Chemical Co., Ltd.), Polyflow No. 75, No. 95 (trade names of Kyoeisha Yushi Kagaku Kogyo K. K.), EF Top EF-301, EF-303, EF-352 (trade names of TOHKEM PRODUCT Co.), Megafac F171, F172, F173 (trade names of DAINIPPON INK & CHEMICALS, INC.), Fluorad FC430, FC431 (trade names of Sumitomo 3M Limited), Asahi Guard AG710, SURFLON S-382, SC-101, SC-102, SC-103, SC-104, SC-105, SC-106 (trade names of Asahi Glass Co., Ltd.) or the like.

In column 12, lines 20-27, Ito et al also teaches these additives.

Other customary additives may also be present, including pigments, sensitizers, preservatives, acid-diffusion controlling agents, adhesion promoters, coating aids such as surfactants or anti-foaming agents, adhesion promoters and plasticizers.

Yamachika and Ito are only two among numerous patents which teach the additives claimed by applicant in a photoresist composition. Applicant is claiming known additives having known beneficial properties in a photoresist composition. The claimed solvent mixture is also known as shown in Allen. Thus, for the reasons above, the examiner maintains the rejections made in the prior office action.

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Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodall et al U.S. patent no. 6,136,499 in view of Allen et al U.S. patent no. 6,165,678.

As shown in Examples 56 and 57 in column 49 Goodall teaches a positive photoresist composition comprising a photoacid generator and a polymer having maleic anhydride (MA) and the tert-butyl ester of norbornene (TBN) as monomers (MA/TBN) in propylene glycol monomethyl ether acetate. The MA monomer meets the limitation of formula Ib in claim 9 wherein Z2 is oxygen and the TBN monomer meets the limitation of formula II in claims 9,10 wherein Z1 forms an alicyclic bridged structure and one of R13-R16 is an acid decomposing t-butyl group and n is 0 as in formula II-A as in claim 11. Goodall teaches other monomers meeting applicant's limitation of formula II in column 5, lines 30-67.

In column 29, lines 37-40, Goodall teaches solvents used in the photoresist composition. Goodall does not teach the solvent is a mixture of solvents as claimed by applicant in claim 9 or the addition of a base as in claims 12 and 13.

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Allen teaches a photoresist composition comprising a polymer having alicyclic pendant groups and a photoacid generator. In column 10, lines 10-35 Allen teaches eight solvents, including propylene glycol monomethyl ether acetate, ethyl lactate and butyl acetate, and states solvent mixtures of the listed solvents may be used. A preferred solvent mixture is propylene glycol monomethyl ether acetate and ethyl lactate.

In column 10, lines 48-64 Allen teaches acid diffusion controlling agents such as a nitrogen basic compounds comprising those claimed by applicant in claim 13 such as pyrimidine and diazabicycloundecenes.

It would have been obvious to one of ordinary skill in the art to use a mixture of solvents such as propylene glycol monomethyl ether acetate and ethyl lactate for the photoresist solvent of Goodall with a reasonable expectation of obtaining a successful resist composition because Allen teaches a preferred solvent mixture for an alicyclic polymer is propylene glycol monomethyl ether acetate and ethyl lactate.

As to claims 12 and 13 it is well known in the art that chemically amplified photoresists benefit from the addition of basic reagents that limit diffusion of the acid generated during resist exposure thus it would have been obvious to one of ordinary skill in the art to add a basic nitrogen compound, such as pyrimidine or a diazabicycloundecene, to the resist composition of Goodall with a reasonable expectation of obtaining a successful resist composition because Allen teaches these compounds stabilize the composition and control acid diffusion of the acid in the

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composition. The motivation to combine the art is to obtain a pattern having improved pattern resolution over a composition not containing the basic compound.

5. Claims 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodall et al cited above in view of Allen et al cited above and Aoi et al U.S. patent no. 5,824,451.

As shown above Goodall teaches a positive photoresist composition comprising a photoacid generator and a polymer having maleic anhydride (MA) and the tert-butyl ester of norbornene (TBN) as monomers (MA/TBN). The MA monomer meets the limitation of formula Ib in claim 4 wherein Z2 is oxygen and the TBN monomer meets the limitation of formula II in claims 4,5 wherein Z1 forms an alicyclic bridged structure and one of R13-R16 is an acid decomposing t-butyl group and n is 0 as in formula II-A as in claim 6. Gooddall teaches other monomers meeting applicant's limitation of formula II in column 5, lines 30-67.

Goodall does not teach the resist composition comprises a surfactant as in claim 4 or addition of a nitrogen base as in claims 7 and 8.

The use of surfactants in photoresist compositions is well known in the art as shown in the teaching of Allen which in column 10, lines 4-10, lists the well known "customary additives" in resist compositions such as "dyes, sensitizers, additives used as stabilizers and acid-diffusion controlling agent, coating aids such as surfactants or anti-foaming agents, adhesion promoters and plasticizers". Allen teaches surfactants are used to control coating uniformity (col. 10, lines 64-65).

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Aoai also teaches the resist "customary additives" and list surfactants of commercially available fluorine and silicon containing surfactants in column 63, lines 14-42.

It would have been obvious to one of ordinary skill in the art to add a fluorine or silicon containing surfactant to the resist composition of Goodall comprising the MA/TBN copolymer with a reasonable expectation of obtaining a successful resist composition because Allen teaches the addition of surfactant provides for a more uniform coating of the resist than without the surfactant.

As to claims 7 and 8 it is well known in the art that chemically amplified photoresists benefit from the addition of basic reagents that limit diffusion of the acid generated during resist exposure thus it would have been obvious to one of ordinary skill in the art to add a basic nitrogen compound, such as pyrimidine or a diazabicycloundecene, to the resist composition of Goodall with a reasonable expectation of obtaining a successful resist composition because Allen teaches these compounds stabilize the composition and control acid diffusion of the acid in the composition. The motivation to combine the art is to obtain a pattern having improved pattern resolution over a composition not containing the basic compound.

Allowable Subject Matter

6. Claims 1-3 are allowed.

The following is an examiner's statement of reasons for allowance: The prior art does not teach a positive photoresist composition having the copolymer claimed and a compound that decomposes under the action of an acid to generate sulfonic acid. The closest prior art is

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Maemoto et al U.S. patent no 6,017,677 which teaches a positive photoresist composition comprising a polymer having pendant functional groups which generate sulfonic acid under the influence of acid.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7. Claim 14 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:
The prior art does not teach addition of a third solvent as claimed.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on

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the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to R. Ashton whose telephone number is (703) 308-2057 or to Supervisory Examiner J. Baxter whose telephone number is (703) 308-2303.

July 22, 2001



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ROSEMARY ASHTON
PRIMARY EXAMINER